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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



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(54) Title: ABSORBENT ARTICLE THAT CONTAINS AN ACTIVE ADDITIVE AND USE OF A VISUAL INDICATOR IN AN ABSORBENT ARTICLE

(57) Abstract: Active additive substances in absorbent articles, such as sanitary napkins, panty liners, tampons, incontinence protectors and diapers, often have limited durability, and have been found to lose their properties and their activity when handled unfavourably. Thus, it is important to be able to determine the activity status of the active additive substance when the absorbent article is used and handled. The present invention relates to an absorbent article that includes at least one active additive substance and that also comprises a visual indicator which gives an indication of the activity status of said active additive substance.

ABSORBENT ARTICLE THAT CONTAINS AN ACTIVE ADDITIVE AND USE OF A VISUAL INDICATOR IN AN ABSORBENT ARTICLE

## FIELD OF INVENTION

- 5 The present invention relates to an absorbent article that contains one or more active substances, and is characterised in that the absorbent article comprises a visual indicator that shows the activity status of the active substance.

## BACKGROUND ART

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- In recent times, different additives have been included in absorbent articles. These additives, or active substances, are often included to improve the properties of the product in some way. Examples of active additives are odour-inhibiting additives, or deodorants, such as zeolites and silica for instance, as described for example in
- 15 WO 97/46188, WO 97/46190, WO 97/46192, WO 97/46193, WO 97/46195 and WO 97/46196. These additives shall function mainly in the actual product. Other examples of active additives include softeners, such as lotions, in diapers, which softeners are intended to be transferred from the product to the wearer's skin. Further examples include the addition of acid superabsorbent polymers (SAP) (SE-
- 20 9804390-4, SE-9804360-7), citric acid (US-A-4,583,980, GB-A-1317156), lactic acid (EP-A-0257007), or some form of acid-producing bacteria for preventing the occurrence of malodours in the products. An example of the addition of acid-producing bacteria is the addition of lactobacilli for inhibiting the growth of bacteria in the product. The lactobacilli may also be transferred to the wearer of the article,
- 25 thereby enhancing defence against undesired bacteria. The addition of lactobacilli and the effect of such addition is mentioned in, *inter alia*, SE 9703669-3, SE 9502588-8, WO 92/13577, SE 9801951-6, SE 9804390-4 and SE 9902207-1.

## PROBLEMS AND DEFICIENCIES WITH KNOWN TECHNOLOGY

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One problem with absorbent products that contain active additives is that the substances often have limited durability. For instance, lactobacilli can be affected negatively by moisture absorption in storage, thereby impairing the effect of the lactobacilli. It is therefore important to package the products in a manner, which  
5 will ensure the longest possible durability. It is also important, of course, to ensure that manufacturing conditions, storage conditions and transportation conditions are such as to make certain that the product will remain durable for as long as possible. It is often very difficult to ensure that a product has been handled optimally throughout the entire chain from its manufacture to its use. Furthermore, it can be  
10 difficult to determine whether or not the active substance in the absorbent product is still fully active.

There is at present no way of determining whether or not an absorbent article that contains active additives has normal activity and function potential.

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## **SUMMARY OF THE INVENTION**

The invention relates to an absorbent article that contains at least one active additive, characterised in that said article comprises a visual indicator that indicates  
20 the activity status of the active additive.

## **DEFINITIONS**

By absorbent article is meant, for instance, a sanitary napkin, a diaper, an  
25 incontinence protector, a tampon, a panty liner and similar products that are comprised partially of an absorbent material, for instance a cellulose material such as airlaid, LDA, chemical pulp or CTMP.

By active additive is meant a substance, an agent, or a composition that is added to  
30 the absorbent article in manufacture and that is intended to change or improve the function of the article in some way. Examples of active additives include odour

inhibitors, such as zeolite and silica, softeners such as lotions, lactobacilli for inhibiting the growth of other micro-organisms, and acids, such as lactic acid and citric acid, acid SAP, and partially neutralised SAP, which are intended to lower the pH and thereby inhibit bacterial growth.

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By visual indicator is meant a substance, a composition, or a material that gives a visual indication of changed conditions in its environment, for instance changes in pH, moisture content or temperature. Examples of visual indicators are chemical substances such as methyl red, methyl violet, methyl orange, bromocresol mauve, Acid Blue 80, blue dye Calcocid Blue 2G, ethyl red, bromophenol blue, bromocresol green, crystal violet, cresol red, thymol blue, erythrosine B, 2,4-dinitrophenol, Eriochrome™ Black T, alizarin, bromothymol blue, phenol red, m-nitrophenol, o-cresolphthalein, phenolphthalein, tymolphthalein, alizarin Yellow Reller, and such material as litmus paper.

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By the activity of an active additive is meant its ability to perform its intended function. If an active additive has impaired activity, this means that its ability to produce lactic acid for instance, as in the case with lactobacilli, is worse than normal. Accordingly, by the activity status of an additive is meant the state of the activity possessed by an active additive on a given occasion.

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## DETAILED DESCRIPTION OF THE INVENTION

The object of the invention is to provide an absorbent article that can indicate the activity status of an active additive included in said article.

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This object can be achieved by including in the absorbent article a visual indicator that will show a change in pH in the absorbent article, said change in pH occurring as a result of a change in the active additive. This change may be because the environment in the absorbent article has become more basic, or more acid, depending on the properties of the active additive and/or of the absorbent article.

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The visual indicator will therefore preferably be selected on the basis of the properties of the active additive and the absorbent article.

5 According to one embodiment of the invention, this is achieved by including in the absorbent article a visual indicator that will give an indication that an included active additive is active and that it remains active during use. In this regard, the active additive produces acid, which results in a change in colour of the visual indicator. This colour change then indicates that the active additive is still active. In a preferred embodiment, the colour change takes place in the pH range of 4-7, or  
10 preferably in the pH range of 5-7.

The active additive may, for instance, be a micro-organism. According to one preferred embodiment, the active additive is an acid producing micro-organism. According to a more preferred embodiment, the active substance consists of  
15 lactobacilli. In an even more preferred embodiment, the active additive consists of lactobacilli of the strain *Lactobacillus plantarum* LB 931 (deposition No. (DSM): 41918).

An active additive that consists of lactobacilli is sensitive to moisture take-up. The  
20 lactobacilli are activated and consumed when stored over a long period of time in a moist environment. This means that a colour change in accordance with the aforescribed embodiment may indicate that the lactobacilli have been activated prematurely, i.e. prior to use of the product. In such a case, this will be shown by the visual indicator by virtue of a visible colour change. When no colour change can  
25 be seen on the visual indicator prior to use, this can be interpreted as meaning that the lactobacilli have still not been activated and that the product is in a fully satisfactory state. Thus, the visual indicator will normally show a colour change when use of the product is commenced.

30 According to one embodiment, the visual indicator shows a colour change when the active substance exhibits activity.

According to another embodiment, the visual indicator shows a colour change when the active substance has been consumed, either in the package prior to use, for instance as a result of poor storage conditions, or during use of the absorbent article.

5

According to still another embodiment, the visual indicator shows a colour change when the absorbent article has taken up moisture, for instance when the absorbent article has taken-up and contains >10 percent by weight liquid.

10 According to yet another embodiment, the active additive or substance is citric acid. Citric acid is activated when wetting the absorbent article, which is indicated by a suitable pH indicator.

15 Lactic acid, acid SAP and partially neutralised SAP may also be used as the active additive.

The visual indicator will preferably be applied in the lowest possible concentration, preferably in a volume of at most 0.1 ml, and more preferably in a volume of at most 0.01 ml. However, the preferred volume depends on the type of visual indicator and the type of absorbent product. Typically, the amount of the visual indicator that is used is approximately 0.1 g/cm<sup>2</sup>. The total surface that will be used for application of the visual indicator is typically 1 cm<sup>2</sup>. The visual indicator may be applied in a pattern, such as in stripes, flowers, dots, loops or text that appear when the visual indicator changes colour. The visual indicator may be applied on top of LDA, or preferably in the nonwoven outer sheet (NW) of the absorbent article. It is preferred that the visual indicator is placed on one of the uppermost layers in the absorbent article and that the visual indicator can be detected on the surface of said article. The packaging unit in which the inventive absorbent article is packaged may be transparent, so that the visual indicator can be seen from outside the package.

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In one embodiment, the absorbent article is, for instance, a panty liner that consists of three layers of material, to-wit an upper nonwoven layer (NW), an intermediate LDA layer and a bottom plastic layer. This article also includes an active substance, for instance lactobacilli or lactic acid, which is applied in the absorbent article. In  
5 this case, the indicator may be applied on the LDA layer or on the NW layer and will conveniently be visible from outside the package.

It is important that the visual indicator is non-toxic or in not in any way harmful to the person wearing the absorbent article.

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According to the invention, the visual indicator may be printed on the absorbent article with the aid of a print roller, or optionally on packaging film that is in contact with the article. This can be effected by rolling roll material over a print roller that is in contact with a bath of indicator liquid. The technique is well known from the  
15 printing trade.

The invention can be applied with absorbent articles such as diapers, panty liners, incontinence protectors, napkins and tampons, and finds the most beneficial use in panty liners, incontinence protectors and diapers.

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#### **ADVANTAGES AFFORDED BY THE INVENTION**

One advantage afforded by the invention is that the consumer obtains information relating to the durability of the product and that the quality of the purchased product  
25 is fully satisfactory.

Another advantage afforded by the invention is that it is possible to see when the active substance has been impaired as a result of external conditions, and if so where in the handling chain from the manufacture to the use of the product the  
30 impairment has occurred. This enables the various stages in the handling chain to be

improved and also enables products whose active substance is no longer fully active to be removed from said chain.

5 Another important advantage afforded with the aid of the invention is that it can be seen when an active substance has been active during use. This activity can be observed after use by virtue of a colour change.



## CLAIMS

1           An absorbent article, such as a diaper, a panty liner, an incontinence  
protector, a napkin, or a tampon that includes at least one active additive substance,  
5   **characterised** in that the absorbent article comprises a visual indicator that  
indicates the activity status of the active additive.

2.           An absorbent article according to Claim 1, **characterised** in that the  
visual indicator changes colour in response to a change in pH or a change in the  
10   moisture content of the absorbent article.

3.           An absorbent article according to any one of Claims 1 or 2,  
**characterised** in that the visual indicator is comprised of methyl red, methyl violet,  
methyl orange, bromocresol lilac, Acid Blue 80, blue dye Calcocid Blue 2G, ethyl  
15   red, bromophenol blue, bromocresol green, preferably methyl orange, methyl red or  
methyl violet.

4.           An absorbent article according to any one of Claims 1-3, **characterised**  
in that the active additive is a micro-organism, preferably an acid producing micro-  
20   organism, more preferably a lactobacillus, and still more preferably a lactobacillus  
of the strain *Lactobacillus plantarum* LB931 (DSM No. 41918).

5.           An absorbent article according to any one of Claims 1-3, **characterised**  
in that the active substance is an acid, preferably citric acid, lactic acid or acid SAP.  
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6.           An absorbent article according to any one of Claims 1-5, **characterised**  
in that the visual indicator is placed on one of the uppermost layers of the absorbent  
product; and in that the visual indicator can be detected on the surface of the  
product.  
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7. The use of a visual indicator in an absorbent article, such as a diaper, a panty liner, an incontinence protector, a napkin or a tampon, that includes at least one active additive substance which provides an indication of the activity status of said active additive substance.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01206

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61L 15/42, A61L 15/56, A61F 13/15, A61F 13/42  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61F, A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9422500 A1 (THE PROCTER & GAMBLE CO.), 13 October 1994 (13.10.94), abstract, see lines 3-4, and line 12 of claim 2 --	1-7
A	US 5217444 A (A. SCHOENFELD), 8 June 1993 (08.06.93), abstract --	1-2
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A	EP 0021492 A1 (THE PROCTER & GAMBLE CO), 7 January 1981 (07.01.81), abstract --	1-2

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01206

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

28/06/00

International application No.  
PCT/SE 00/01206

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